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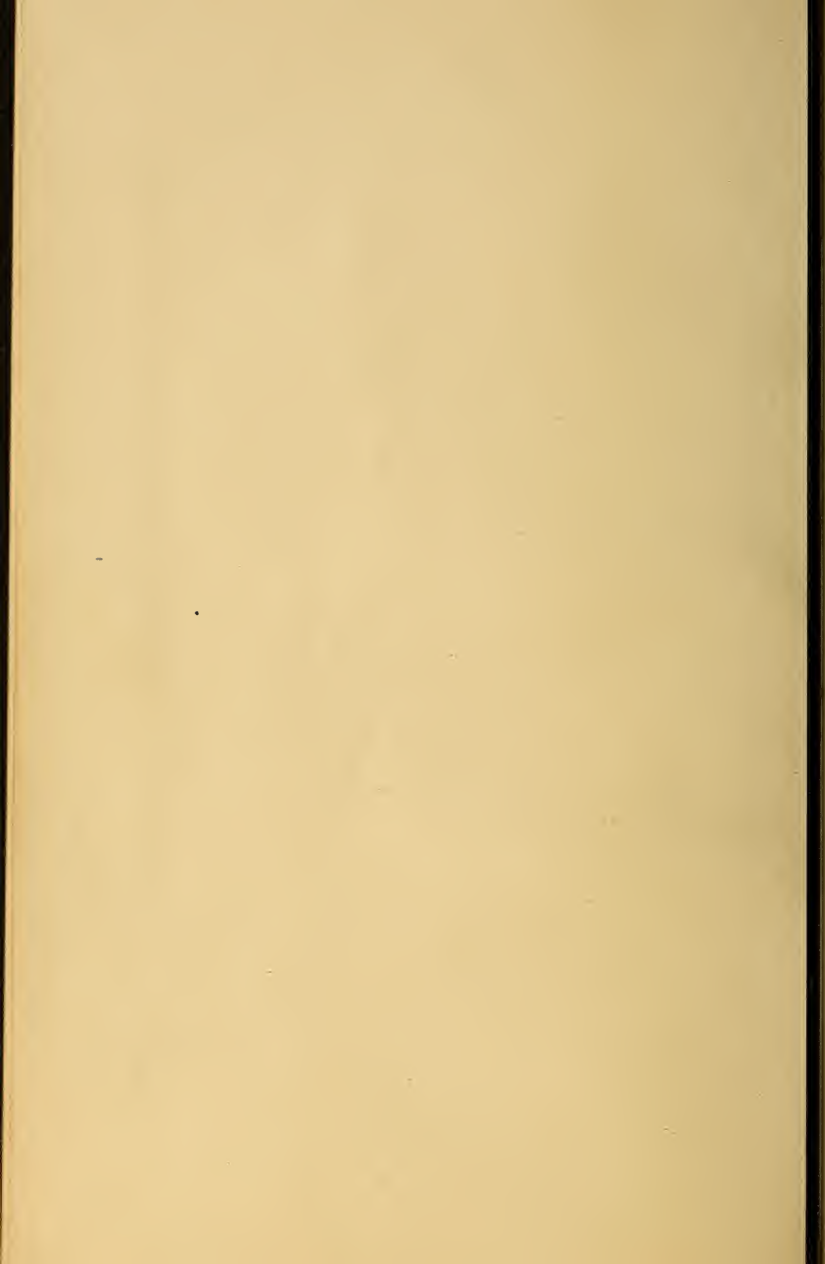
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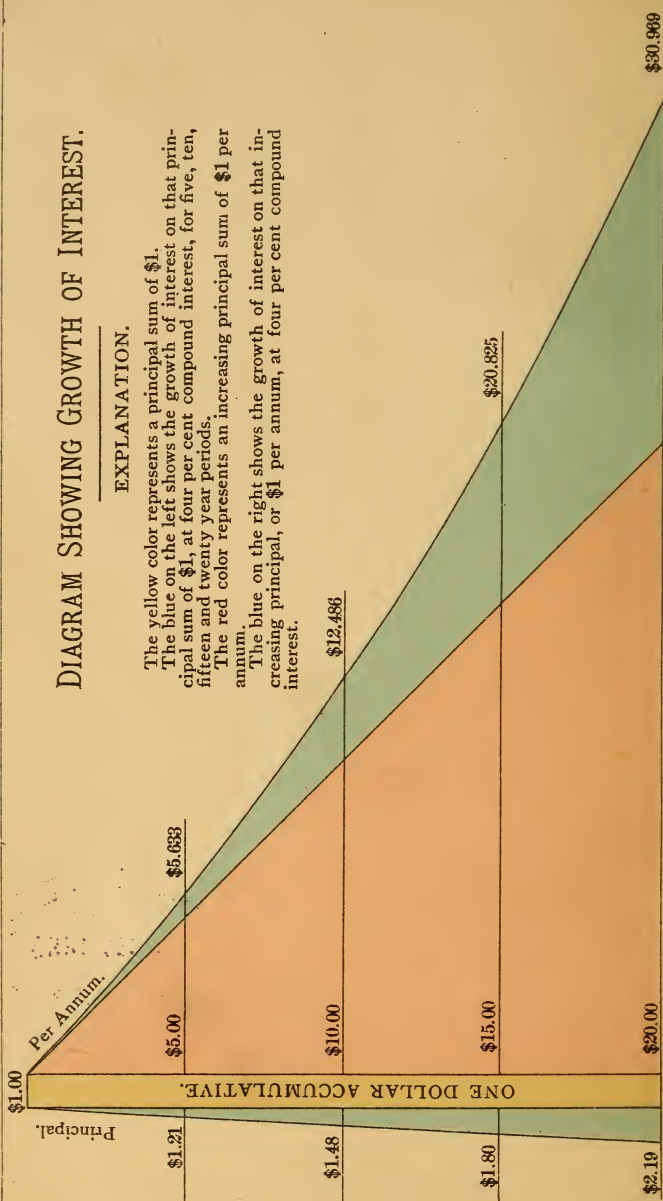
DIAGRAM SHOWING GROWTH OF INTEREST.

EXPLANATION.

The yellow color represents a principal sum of \$1.
 The blue on the left shows the growth of interest on that principal sum of \$1, at four per cent compound interest, for five, ten, fifteen and twenty year periods.

The red color represents an increasing principal sum of \$1 per annum.

The blue on the right shows the growth of interest on that increasing principal, or \$1 per annum, at four per cent compound interest.



THE

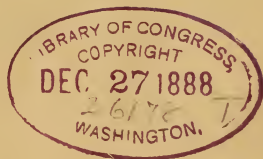
A B C

OF

LIFE INSURANCE.

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BY CHARLES E. WILLARD.



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PREFACE.

To explain and illustrate some of the fundamental and elementary principles of Life Insurance so simply that they can readily be understood by men who have not been specially trained as mathematicians, or have not had their attention particularly directed to the theory and mathematics of Life Insurance, is the aim of this little book. For those who already possess this elementary knowledge, there are many excellent hand-books which carry the discussion much further, and cover the entire subject in the ablest and most satisfactory manner. But as an introduction to these, a beginning, an "easy lesson," it is hoped that the following pages will have their use. They owe their existence to the impossibility of finding among the text-books already published, anything which seemed exactly adapted to this purpose.

C. E. W.

NEW YORK, November 1, 1888.

THE
A B C
OF
LIFE INSURANCE.

CHAPTER I.

A PRELIMINARY STUDY.

Insurance, in its simplest form, is indemnity for loss. Or it may be described as a method of distributing an individual's loss among a large number of other persons who are willing to assume each his small share of it, in return for the certainty that if a similar loss falls upon any one of them, the loser, or those dependent upon him, will in like manner be indemnified. If a building or stock of goods is burned, so much capital is destroyed. If a productive human life ends, so much capital in another form is destroyed. For convenience in apportioning the loss, or dividing it among those interested, the machinery and organization of a company are invoked. The company contracts to pay the loss, the company collects the premium, the company pays the loss if it occurs. Consequently, the com-

NOTE.—It is sometimes flippantly said that insurance is simply a form of gambling, the company betting a large sum that a certain loss will not occur, the insured betting a small sum that it will; if the loss occurs, the company pays the bet. In so foolish a statement as this, only the element of chance is taken into account. No consideration is had of the fact that the insured receives the worth of his money, in any event, in the protection afforded—the certainty that he will be indemnified if the loss falls on him. A bet involves the payment of money without any equivalent in return.

pany is said to insure each individual, but it must be remembered that the actual function of the company is that of a medium through which the business is transacted, and that the result is simply the apportionment of such individual losses as occur, among a large number of insured who assume the payment of these losses from year to year in order that they may themselves claim a like indemnity should the occasion arise. If this fact were thoroughly understood in life insurance, as it is in fire, more correct ideas of the values of life policies would prevail even among those who have no technical knowledge of the subject.

Two or three elementary principles constitute the foundation of all life insurance. They are so simple that they need only to be presented to be comprehended by any person of ordinary intelligence. Their practical application to various contingencies may, and often does, involve mathematical calculations which are not only very lengthy but also very intricate. This fact has thrown a veil of mystery over the whole subject, which does not properly belong to it. One need not be an actuary or expert mathematician to have a very fair knowledge of the fundamental principles. The following example will enable us to study these principles:

It should be understood in advance that the supposed conditions of this example, so far as the rate of mortality (or number of deaths in a year) is concerned, are not those which we meet in actual experience. The term of life is shortened from ninety-six years to fifty, that the calculation may be proportionately shortened. The number of deaths each year, and the amount of insurance on each individual, are purposely such as to make the calculation very simple, and susceptible of instant verification. Consequently, our

results will not be the results of actual experience. The premium will be very much too high, the annual cost of the insurance very much too great, the accumulation of reserve very much too rapid.

But the two or three elementary principles which we wish to study are perfectly and exactly illustrated. As will be shown later on, the same process applied to the conditions which actually exist, will secure correct results.

BEARING THIS IN MIND :

Let us suppose that a company is formed of 1000 men ; that the age of each man is 40 ; that each is insured for \$1100 ; that 100 men will die during the first and each succeeding year ;* that every man remains in the company until his death occurs ; that the company receives nothing for interest on money in its hands, and pays nothing for the expense of conducting the business. Suppose, also, that for the sake of convenience these men agree to pay a uniform amount each year so long as they live, as a premium for the insurance.

It is evident that the total amount of insurance to be paid would be $1000 \times \$1100$, or \$1,100,000.

It is also evident that there would be 1000 men to pay premiums the first year, 900 the second year, 800 the third year, and so on. The total number of premium payments made would be 5500. Each payment therefore must be $\$1,100,000 \div 5500$, or \$200, which, upon our assumption,

* As a matter of fact, we should expect that the number of deaths among 1000 men, age 40, would be but 9 or 10 the first year, and that 1 or 2 of the 1000 men would survive the age of 90. To make our supposition conform to these facts would extend our calculation over 50 years. The assumption which is made above, reduces the term to 10 years, and so avoids the tediousness of the calculation based upon the longer, actual term.

would be the annual, whole-life premium for an insurance of \$1100 upon the life of a man aged 40.

The results would be as follows :

1,000 × \$200 =	\$200,000,	Premiums received beginning of	} First Year, Age 40.
100 × \$1,100 =	110,000,	Losses paid during	
	<u>\$90,000,</u>	Amount in hand at end of	

900 × \$200 =	\$180,000,	Premiums received beginning of	} Second Year, Age 41.
	<u>\$270,000,</u>	Total am't in hand beginning of	
100 × \$1,100 =	110,000,	Losses paid during	
	<u>\$160,000,</u>	Amount in hand at end of	

800 × \$200 =	160,000,	Premiums received beginning of	} Third Year, Age 42.
	<u>\$320,000,</u>	Total am't in hand beginning of	
100 × \$1,100 =	110,000,	Losses paid during	
	<u>\$210,000,</u>	Amount in hand at end of	

700 × \$200 =	140,000,	Premiums received beginning of	} Fourth Year, Age 43.
	<u>\$350,000,</u>	Total am't in hand beginning of	
100 × \$1,100 =	110,000,	Losses paid during	
	<u>\$240,000,</u>	Amount in hand at end of	

600 × \$200 =	120,000,	Premiums received beginning of	} Fifth Year, Age 44.
	<u>\$360,000,</u>	Total am't in hand beginning of	
100 × \$1,100 =	110,000,	Losses paid during	
	<u>\$250,000,</u>	Amount in hand at end of	

500 × \$200 =	100,000,	Premiums received beginning of	} Sixth Year, Age 45.
	<u>\$350,000,</u>	Total am't in hand beginning of	
100 × \$1,100 =	110,000,	Losses paid during	
	<u>\$240,000,</u>	Amount in hand at end of	

400 × \$200 =	80,000,	Premiums received beginning of	} Seventh Year, Age 46.
	<u>\$320,000,</u>	Total am't in hand beginning of	
100 × \$1,100 =	110,000,	Losses paid during	
	<u>\$210,000,</u>	Amount in hand at end of	

300 × \$200 =	60,000,	Premiums received beginning of	} Eighth Year, Age 47.
	\$270,000,	Total am't in hand beginning of	
100 × \$1,100 =	110,000,	Losses paid during	
	\$160,000,	Amount in hand at end of	
200 × \$200 =	40,000,	Premiums received beginning of	} Ninth Year, Age 48.
	\$200,000,	Total am't in hand beginning of	
100 × \$1,100 =	110,000,	Losses paid during	
	\$90,000,	Amount in hand at end of	
100 × \$200 =	20,000,	Premiums received beginning of	} Tenth Year, Age 49.
	\$110,000,	Total am't in hand beginning of	
100 × \$1,100 =	110,000,	Losses paid during	
	00		

Now it is evident that the *principles* involved in fixing the premium and collecting the necessary amounts to pay losses in full, until the last contract is met, must be the same, whether the death rate be 9 or 100 per annum, and the term 10 or 50 years. Let us see, then, what can be discovered by a study of the above.

In the first place it is evident that the cost of the insurance—*i. e.*, the amount of the losses in any one year divided by the number of men living at the beginning of that year—varies from year to year, although the annual premium remains the same. The losses for the first year are \$110,000. The number of men to pay premiums is 1000. The *cost* of the insurance, therefore, is \$110,000 ÷ 1000, or \$110 per man. The second year the losses are \$110,000. There are but 900 men, however, to pay premiums, 100 men having died. Consequently, the *cost* of the insurance is \$110,000 ÷ 900, or \$122.33 per man. In the same way the cost the third year is \$110,000.00 ÷ 800, or \$137.50 per man; the fourth year, \$110,000 ÷ 700, or \$157.14 per man—and so on. When we reach a point where more than one-half

of the original number of men is dead, or will have died before the end of the year, the *cost* will exceed the premium. Thus, in the sixth year, the cost is $\$110,000 \div 500$, or $\$220.00$ per man. And, from this point, the cost continues to exceed the premium by an annually increasing amount to the end.

It is evident, therefore, that a uniform or, as it is usually called, a "level" premium, involves the annual payment of a sum in excess of the current cost of the insurance during a part of the term, and the annual payment of a sum less than the current cost of the insurance during the remainder of the term. Consequently, whatever is overpaid during the former portion of the term must be held in hand, *reserved*, to provide against the deficit which would otherwise occur during the latter part of the term.

The same fact appears from an inspection of the figures above, without stopping to calculate the cost of the insurance. Thus we see that the premiums received exceeded the losses paid by $\$90,000$ the first year, $\$70,000$ the second year, and so on up to the sixth year. Then the losses began to exceed the premiums, the excess being $\$70,000$ in the ninth year, and $\$90,000$ in the tenth year. If, now, the company finding itself with $\$90,000$ in hand at the end of the first year, $\$160,000$ at the end of the second year, $\$210,000$ at the end of the third year, had overlooked the call to be made upon these funds in the future, and had spent or, through carelessness or misfortune, lost some of these funds, had failed to keep the full amount intact, there would have been finally a deficit of exactly the amount so lost or spent. Ten thousand dollars a year might be spent for several successive years without affecting the company's ability to pay its current losses, but the time would surely come when the absence of the money would show itself in

the inability of the company to carry its contracts of insurance to the end. It is plain, therefore, that at the *end* of each year the company would have in its possession a sum of money which it must carefully RESERVE for the future fulfillment of its existing contracts.

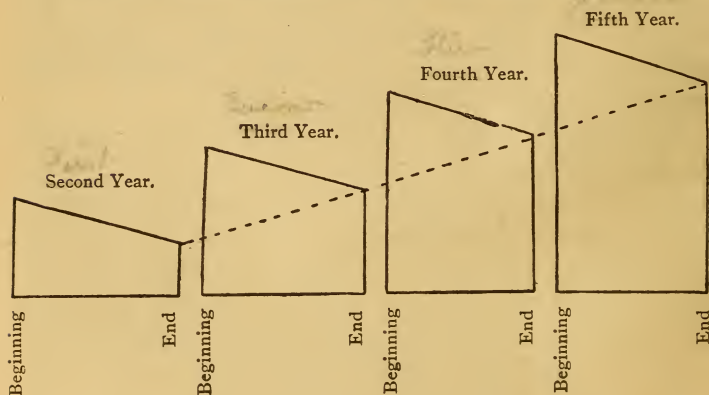
Another point. At the *beginning* of each year (for the above example supposes that the company receives all its premiums at the beginning of the year), there would be on hand the money brought over from the preceding year plus the premiums for the current year. A portion of this total amount would have to be held for the payment of the current losses of this year. To distinguish this from the amount to be carried forward at the end of the year, we will call it the *insurance* reserve. Since this would be paid out at intervals during the year, as losses occurred, the sum left in the company's hands would slowly diminish until, at the end of the year, the *insurance* reserve would be entirely (and properly) expended in the payment of losses, and only that amount of money which must be held for the future would remain. This latter amount, since it must be held for a series of years, and might be invested in interest-bearing securities, we will call the *investment* reserve.

This suggests another point, viz.: that while the reserve of a policy may be said to increase each year that the insurance is in force, this increase, so long as premiums are paid, is not an absolutely uniform one. The reserve is greater at the beginning of the year, because it includes both the *insurance* and the *investment* portions; diminishes during the year, because the *insurance* portion is expended gradually in the payment of losses; but at the end of each year is greater than at the end of the preceding year, because the *investment* portion of that year is added to the *investment* portion of the preceding year or series of years.

If we divide the amount of money in the hands of our supposed company at the end of the first year by the number of survivors at the end of that year, we have $\$90,000 \div 900$, or $\$100$. This is the amount of reserve for each policy (or insurance) at the end of the first year. After the premiums have been paid at the beginning of the second year, and before any deaths have occurred for that year, the reserve on each policy would be $\$270,000 \div 900$, or $\$300$. At the end of that year the reserve would be $\$160,000 \div 800$, or $\$200$ on each insurance. By putting the figures of reserves at the beginning and end of several years in parallel columns, this point will be more clearly seen:

	Beginning of Year.	End of Year.
Reserve second year.....	\$300	\$200
Reserve third year.....	400	300
Reserve fourth year.....	500	400
Reserve fifth year.....	600	500

This may be represented by a diagram as follows:



Perhaps the function of the *investment* reserve may be shown in another way. Suppose that the company of 1000

men had agreed to pay each year the exact cost of the insurance for that year. Taking our figures of *cost* on page 8, the results would be as follows :

1,000 × \$110	= \$110,000,	Premiums rec'd beginning of	}	First Year, Age 40.
100 × \$1,100	= 110,000,	Losses paid during		
	<hr/>	00, Amount in hand at end of		
900 × \$122.23	= \$110,000,	Premiums rec'd beginning of	}	Second Year, Age 41.
100 × \$1,100	= 110,000,	Losses paid during		
	<hr/>	00, Amount in hand at end of		
800 × \$137.50	= \$110,000,	Premiums rec'd beginning of	}	Third Year, Age 42.
100 × \$1,100	= 110,000,	Losses paid during		
	<hr/>	00, Amount in hand at end of		
		etc., etc., etc.		

Here, as the increasing premiums take care of the current losses for each year, there is no need of carrying any amount forward from one year to another, and the *investment* reserve disappears altogether. The *insurance* reserve at the beginning of each year is the full amount of the expected losses for that year. As these losses occur and are paid the reserve diminishes, and at any time during the year is measured by the amount of expected losses for the remainder of the year. At the end of the year, all losses having been paid, it is nothing.

It appears then, that, leaving out the question of expenses, the level premium is made up of two parts—the insurance portion, which pays the current losses of the year, and the investment portion, whose sole purpose and use are to keep the premium level. The investment reserve (and this is what is usually meant by the term “Reserve”) may be defined as that part of a level or uniform premium, not needed for current losses, which is set aside for pur-

poses of accumulation, to be used, with its accretions, in payment of future losses.

Incidentally, it should be noted that the reserve of each policy in our example is \$1100 at the tenth or final year, and that the actual cost of the insurance for that year is also \$1100.

From this preliminary study, then, it is evident that a company must either collect an annually increasing premium, correctly adjusted to the annually increasing cost, or must accumulate from a level or uniform premium an invested reserve fund; that this reserve, if accumulated, must be kept intact until needed for its legitimate purpose, viz.: the payment of such a portion of each policy as that policy has contributed to it; that the waste or loss of this reserve means ultimate bankruptcy, on account of the increasing cost of the insurance for which the level premium, *without* the accumulated reserve, does not provide; and that the reserve upon any policy increases with the age of that policy or the number of years it has been in force. We can also see that the man who wishes insurance must continue

NOTE.—Another definition of a reserve is "The difference between the present value of the insurance, and the present value of the future premiums on that insurance." As an illustration of this definition, our example is very crude, since it ignores the question of compound interest, which is the important factor in determining present values. Nevertheless, it suggests the method of calculating the reserves for insurances at different ages and under policies upon which premiums have been paid for different terms of years, as actually practiced. Thus, in our supposed company, at the end of the third year there were 700 survivors, upon each one of whom there was an insurance of \$1100, or a total of \$770,000. The total amount of premiums to be paid during the remainder of the term of years covered by the example was \$560,000. Of course, if interest is to be ignored, there is no difference between present and future values. Consequently, the present values of the insurances and of the future premiums would be their full amounts. The difference, \$210,000, is the amount of the reserve at the end of the third year given in our example.

to pay his premiums thereon ; that the men who die during the earlier part of the term do not pay the company, in premiums, an amount equal to the amount of their insurance ; and that the men who live to the latter part or end of the whole-life term pay, in premiums, more than the amount of their insurance.

Simple and elementary as is the preceding discussion, it will repay careful study by anyone unfamiliar with the theory of insurance. And when its points have been mastered thoroughly, the preparation will be ample for a ready understanding of what follows in this little volume.

Our illustration was based upon the supposition that the 1000 men were all of the same age ; that no other men came into the arrangement ; that none of the original number dropped out by the way ; that in each year the number of deaths was exactly what it was expected to be when the company was formed ; that nothing was realized for interest by the investment of funds on hand ; and that there was no expense connected with the transaction of the business. In actual experience, men of all ages are insured in the same company ; new members are continually coming in ; old ones are dropping out ; new sets of reserves are taking the places of those which have been applied in the payment of losses or have been withdrawn ; the rate of mortality varies more or less from the tabular rate ; interest is received on investments ; and expenses are incurred in various ways. An attempt will be made in the following pages to discuss some of these matters briefly and simply, but to carry the discussion only so far as may be necessary to an intelligent comprehension of the subject in a somewhat general way.

CHAPTER II.

MORTALITY TABLES.

If insurance is simply a method of distributing or apportioning individual losses among a large number of people who enter into the arrangement for mutual protection, the fact will at once suggest itself that each person should pay not only in proportion to the amount of his possible loss, but also in proportion to the likelihood that that loss will occur. Risks are classified for fire insurance according to the hazard of fire. In like manner, the life most likely to end should pay the highest premium. Aside from the special risk to which any individual life may, at any given time, be subjected by reason of sickness or accident, it is evident that the older a man grows the nearer he is to death. Consequently, in determining the amount of premiums which any individual should pay, it is evident that his age must be the prime factor. The first thing, then, to be determined is the effect of age upon the rate of mortality—in other words, how many deaths within a year may be expected among a given number of men of any given age.

No business in the world has a more reliable basis upon which to make its calculations than that of life insurance. The rate of mortality among lives of different ages has been made a matter of study and record for more than 150 years. The tabulated results are known as "Mortality Tables" or "Tables of Mortality."

The first used as a basis for life insurance was the Northampton Table. This was formed by Dr. Price from observations on the mortality in the town of Northampton, England, from 1735 to 1780. This table is no longer used for valuations, and has never been used in this country.

The Carlisle Table was formed by Mr. Milne from observations in the town of Carlisle, England, from 1778 to 1787. It is still in use to a limited extent.

The Actuaries' or Combined Experience Table, published in 1843, was compiled from the experience of seventeen English companies. It is still used very generally in England for the computation of premiums, and in this country as the legal standard for computing reserves with four per cent interest.

The Farr Table, No. 3, was constructed by Dr. Farr from observations upon the mortality of the entire population of England, and was published in 1864. It is not now in use.

The American Experience Table was formed from the experience of the Mutual Life of New York by Mr. Sheppard Homans, actuary of that company. It is in general use in this country for the computation of premiums, and as the legal standard for computing reserves with four and one-half per cent interest.

The experience of thirty American companies was tabulated by Mr. L. W. Meech, and the results published in 1881. This table is generally known as the Meech Table. It is very valuable as a record of actual experience, but is not used in valuations.

For present purposes it is necessary to give the Actuaries' and American Experience tables only. These will be found on pages 51, 52 and 53.

From the latter table anyone who is interested to do so, and has the time to spare, can substitute the proper figures

for those given in the preliminary example, and can calculate the necessary annual, whole-life premium for any age *without allowance for interest or expenses.*

By dividing the number of deaths during any year by the number of persons living at the beginning of that year, we obtain the percentage of mortality as given in connection with these tables.

From the mortality tables, also, by averaging the after-life time of the number of persons living at any given age, we obtain the table of the Expectation of Life given on page 50. This table is interesting, but not particularly useful. It is never employed in making calculations. The supposition that the annual premium to be paid by a person of any given age is the sum which, invested at four or four and a half per cent during the "expectation" of that person, would equal the amount insured; or that the present value of an insurance, payable at death, can be ascertained by discounting the amount of the insurance at four or four and a half per cent for the number of years represented by the "expectation" of the insured, is wholly erroneous.

So, too, the *average age* of a number of lives is not a reliable measure of the risk upon them all. Thus, the average age of 10 men aged 98, and 10 men aged 30, would be 64 years. Among these 20 men we should expect at least 10 deaths during the year, while among 20 men aged 64 we should not expect more than one death.

CHAPTER III.

NET PREMIUMS.

A net premium is one in the calculation of which due allowance has been made for the interest which a company may receive upon its investments, but with no allowance for the expenses of the business.

Thus far we have, for the sake of simplicity, neglected the question of interest. But, since a company may realize considerable amounts in the way of interest upon judiciously invested funds, not needed for present use, it is plain that, in determining the premium which it is necessary to charge, due consideration of this source of income should be had. Obviously, the rate of premium will be reduced by the fact that interest receipts are to be added to the company's income. If too great a reduction is made, however, the premium will not be sufficient. And, as life insurance contracts may cover a very long period, premiums must be based upon assumptions which are likely to be realized in actual experience through an indefinite term of years. With this fact in view, 4 per cent has been taken as the probable rate of interest, in the calculation of premiums.

The following explanation of the method of calculating a net annual premium for an insurance for the term of five years, presents only the very simplest form of such calculations, the design being rather to illustrate principles and the method of their application, than to present or attempt to demonstrate intricate mathematical problems.

What should be the net annual premium (level) for an insurance of \$1000, for the term of 5 years only, upon the life of a man aged 40, according to the American Experience Table with 4 per cent interest?

An annuity is the recurring annual payment of a uniform amount. Consequently the annual premium is an annuity paid by the insured to the company. Manifestly, therefore, the proper method of ascertaining the required premium is to ascertain the present value of the insurance, and then to determine the amount of an annuity whose present value is equal to the present value of the insurance. We will calculate the present value of an insurance for \$1 and then find the corresponding annuity. The latter will be the annual premium for an insurance of \$1, which must be multiplied by the number of dollars of any desired insurance to obtain the necessary premium therefor.

In this, and in all similar calculations, the premium is considered payable at the beginning of the year, and the loss at the end of the year.

Present value of (or, in other words, single premium for) an insurance of \$1, for a term of 5 years, upon the life of a man aged 40.

By the American Experience Table (page 51) it appears that, out of 78,106 person living at age 40, there will die

In the 1st year, 765 persons.

In the 2d " 774 "

In the 3d " 785 "

In the 4th " 797 "

In the 5th " 812 "

An insurance of \$1, therefore, upon each person, would require the payment of \$765.00 at the end of the first year, \$774.00 at the end of the second year, and so on. From the

table of present values of \$1 (page 56) we find that the Present value at 4 per cent of \$1 payable in 1 year is \$0.961538.

Present value at 4 per. cent of \$1 payable in 2 years is \$0.924556, etc.

Therefore the present value of the above losses is as follows :

Of the \$765.00,	\$765 × .961538	\$735.58
Of the 774.00,	774 × .924556	715.60
Of the 785.00,	785 × .888996	697.86
Of the 797.00,	797 × .854804	681.28
Of the 812.00,	812 × .821927	667.40
Total present value of losses.....		\$3,497.72

If the 78,106 persons living at the beginning of the term were to divide this present value into 78,106 single payments, to be made at once, the result would be \$3,497.72 ÷ 78,106, or \$0.04478, and this would be the present value of an insurance of \$1, and consequently the single premium which each man should pay in advance for such an insurance.

But we wish to find an annual premium (or annuity) whose present value shall equal the above present value of the insurance. This will, of course, be an annuity for 5 years contingent upon the lives of 78,106 persons, aged 40. We will first find the present value of such an annuity for \$1.

By the same table of mortality, we find that if each person living at the beginning of each year should pay \$1, the company would receive

At the beginning of the 1st year, \$78.106.00.

At the beginning of the 2d year, 77,341.00.

At the beginning of the 3d year, 76,567.00.

At the beginning of the 4th year, 75,782.00.

At the beginning of the 5th year, 74,985.00.

Of course, the present value of the first payment would be the entire amount of that payment, since it is made at once. The present value of the second payment would be the present value of that amount payable in 1 year; of the third, the present value of that amount payable in 2 years; and so on. Resorting again to the table of present values of \$1, we have

Present value of the \$78,106.00.....	\$78,106.00
Present value of the 77,341.00 = $77,341 \times .961538$	74,366 31
Present value of the 76,567.00 = $76,567 \times .924556$	70,790.48
Present value of the 75,782.00 = $75,782 \times .888996$	67,369.89
Present value of the 74,985.00 = $74,985 \times .854804$	64,097.48
Total present value of all the payments.....	<u>\$354,730.16</u>

This total depends upon the lives of 78,106 persons—the number living at the beginning of the first year. Consequently, the amount depending upon the life of any one person must be $\frac{\$354,730.16}{78,106}$, or \$4.54164. This, then, is the

present value of an annuity of \$1 for 5 years, contingent upon the life of a person aged 40. This value is much larger than the value of the insurance, which is only \$0.04478. Consequently the required annuity or annual

premium will be only $\frac{4.478}{454,164}$ of \$1, or \$0.00986. This is

the net annual premium for an insurance of \$1 for the term of 5 years on a life aged 40. The premium for an insurance of \$1000 would be $1000 \times \$0.00986$, or \$9.86.

It will be seen at once that, if the term of the insurance, instead of being limited to 5 years, had covered the entire term of life according to the American Experience Table, the result would have been the net annual, whole-life premium.

The following example carries the premium, interest, reserve and loss accounts through the five-year term, with the above premium and with the rate of mortality shown by the American Experience Table :

78,106 × \$9.86 =	\$770,125.16,	Premiums rec'd beginning of	}	First Year, Age 40.
	30,805.01,	4 per cent interest		
	\$800,930.17,	Total		
765 × \$1000 =	765,000.00,	Death claims during		
	\$35,930.17,	Reserve end of	}	Second Year, Age 41.
77,341 × \$9.86 =	762,582.26,	Premiums rec'd beginning of		
	\$798,512.43,	Total beginning of		
	31,940.50,	4 per cent interest		
	\$830,452.93,	Total	}	Third Year, Age 42.
774 × \$1000 =	774,000.00,	Death claims during		
	\$56,452.93,	Reserve end of		
76,567 × \$9.86 =	754,950.62,	Premiums rec'd beginning of		
	\$811,403.55,	Total beginning of	}	Fourth Year, Age 43.
	32,456.14,	4 per cent interest		
	\$843,859.69,	Total		
785 × \$1000 =	785,000.00,	Death claims during		
	\$58,859.69,	Reserve end of	}	Fifth Year, Age 44.
75,782 × \$9.86 =	747,210.52,	Premiums rec'd beginning of		
	\$806,070.21,	Total beginning of		
	32,242.81,	4 per cent interest		
	\$838,313.02,	Total	}	
797 × \$1000 =	797,000.00,	Death claims during		
	\$41,313.02,	Reserve end of		
74,985 × \$9.86 =	739,352.10,	Premiums rec'd beginning of		
	\$780,665.12,	Total beginning of	}	
	31,226.60,	4 per cent interest		
	\$811,891.72,	Total		
812 × \$1000 =	812,000.00,	Death claims during		
Excess of death claims, \$108.28				

The excess of the death claims, \$108.28, represents about one-seventh of a cent for each person living at the end of

the fifth year. It is impossible to express the premium more exactly, in dollars and cents, than \$9.86. A premium of \$9.87 would show an excess of receipts over death claims of about \$4,207.52, or 5.6 cents for each person living at the end of the term.

The foregoing illustration shows that a considerable amount of work is involved in determining the premium for the simplest form of insurance for one age only, and for so short a term as five years. It will be seen at once that the computation of premiums for every age and for long terms would be an exceedingly laborious process. And when different forms of insurance and contingencies involving more than one life are to be considered, the mathematical problem may be one of great intricacy and difficulty. Logarithms, the processes of algebra, and various devices, such as "Commutation Columns," for lightening the labor of computation, are employed by the actuaries or expert mathematicians who make the calculations. One who desires to acquaint himself with the mathematics of life insurance can find a large number of text books from which to choose. For our purpose it is unnecessary to follow the subject further. Tables of net annual and single premiums will be found on pages 57 and 58.

NOTE.—In whole-life insurance, as has already been shown, the fund at the end of the last year (age 95, American Table) will equal the total amount of the insurance. In term insurance as above, the fund at the end of the last year is not equal to the total amount of the insurance, but is equal to the amount of insurance which is to be paid as death claims during that year.

CHAPTER IV.

GROSS OR OFFICE PREMIUMS.

To the net premium must be added a certain amount with which to pay the expenses of conducting the business and to provide for contingencies. This amount is called the margin or loading. It is usually a percentage of the net premium. The loading and net premium together constitute the gross or office premium—that which the company charges for the insurance. Thus, from our example illustrating the computation of a net premium we have

Net premium for a five-year term insurance of \$1000, age 40.....	\$9.86
Margin or loading, say $33\frac{1}{2}$ per cent.....	3.29
Gross or office premium.....	<u>\$13.15</u>

The loading is usually a percentage of the net premium. Its amount varies with the form of the insurance and the objects which the company has in view. If it is intended to return a portion of the premium in the shape of dividends to the policyholder, the loading will be higher than when no such return is contemplated. Premiums so loaded are called “mutual” or “participating” premiums. Those from which no dividend is paid are called “stock” or “non-participating” premiums.

All annual premiums are supposed to be paid at the beginning of the policy year. If, by consent of the company, the premiums are paid semi-annually or quarterly, the unpaid installments of the annual premium are called “deferred” premiums. Interest is charged on them, and

their amount is always deducted from the amount of the insurance in case of a claim. As has already been stated, premiums are computed upon the theory that the full annual premium is paid at the beginning of the year, and the premiums are smaller than they would otherwise be. Consequently the company is fairly entitled to retain the unpaid installments.

An analysis of the first year's premium at different ages, showing what portion of the net premium is used for death claims and what for reserve, the amount of loading, and the gross premium made up of these three items, is given on page 58.



CHAPTER V.

RESERVES; LOANS; REINSURANCE.

But little need be added to what has already been said concerning reserves. Their nature and function have been fully explained. Nor is it necessary to attempt an explanation of the method of calculating them. Remembering the definition of a reserve, "the difference between the present value of the insurance and the present value of the premiums thereon," it will be seen that compound interest is again an important factor. The interest received upon the fund representing the reserve, or upon the securities in which that fund is invested, may be added to the fund from time to time, thus lessening the amount of the principal which must be set aside for investment.

To put it in another way, it is evident that if a company is to receive interest on its investments, it need not reserve so much money at the present time to meet a certain amount of future liabilities as it would have to reserve if no interest were to be received. Also, the higher the rate of interest the smaller the reserve required. If you must have \$1000 at the end of a year, and can get but 4 per cent interest, you must put aside or reserve at the beginning of the year \$961.54. But if you can get 10 per cent you need reserve only \$909.09. Reserves are usually calculated upon the basis of the Actuaries' Table with 4 per cent interest, or the American Experience Table with $4\frac{1}{2}$ per cent interest. Of course those calculated on the latter basis are the smaller. The following table shows the

reserves on a policy of \$1000, issued at age 35, computed according to the different standards.

	American Experience with 4½ per cent Interest,	Actuaries' with 4 per cent Interest.
End of 1st year.....	\$9.82	\$11.48
End of 5th year.....	53.20	61 34
End of 10th year.....	117.45	133 41
End of 15th year.....	193.43	214 30
End of 20th year.....	279.59	301.35

The percentage of difference decreases with the age of the policy, that is, the number of years it has been in force.

Tables of Reserves according to the higher standard, the Actuaries' Table of Mortality with 4 per cent interest, are given on pages 54 and 55. These are the reserves on premium-paying, ordinary life policies. The reserves on paid-up policies are, of course, the net single premiums given in the table on page 57.

There are many forms of insurance, as will be seen from chapter VII. Each corresponding form of policy has its own special premium, which must, of course, provide for its own sufficient reserve. The net premiums and reserves given in the tables herewith, are those on the most ordinary form of life policy only. These are sufficient, in the way of elementary illustration, for the present purpose.

From the nature of a reserve, it is always reckoned a liability of the company. It must be kept intact for its proper use, as already explained. If it is not, and the impairment is too great to be made good, the laws of the different States require, under differing conditions, the winding up of the company, upon the theory that, although the company may be amply able to pay its current claims, the time will surely come when it will be unable to do so. Consequently the matter of suitable investments which shall be safe, and at the same time shall return a fair rate of in-

terest, is one of prime importance to a company. The laws of most States prescribe the forms of investments which a company may make.

It should be noted in passing that the larger the reserve on a policy, the less the amount which the company has at risk in the insurance. Thus, if the reserve on a policy of \$1000 is \$500, it is evident that the company need add but \$500 from its current income to make up the full amount of the insurance. From this point of view, and regarding the reserve in the light of a deposit made by the policyholder with the company, Mr. Elizur Wright gave to the reserve the definition of "self-insurance." The actual loss to a company through death claims is not the total amount of those claims, but the difference between that amount and the total amount of the reserves credited to the policies under which the claims are paid.

The following table shows the accumulation of the reserve under a policy of \$1000, ordinary life plan, issued at age 40. Column 1 gives the portion of the premium which is set aside each year for reserve. This diminishes each year, as the actual cost of insurance increases each year. Column 2 gives the total amount of the reserve held by the company at the end of each year. Of course, at the end of the first year, this is the reserve portion of the first year's premium, with one year's interest at four per cent added. At the beginning of the second year, the reserve portion of the second year's premium is added to the total amount of reserve held at the end of the first year. To this sum, one year's interest at four per cent is added, and the total is the reserve at the end of the second year. And so on for each year.

The net amount at risk is obtained by subtracting the reserve held by the company at the end of each year, from \$1000, the full amount of the insurance.

ACCUMULATION OF RESERVE; DECREASE OF AMOUNT AT RISK.

Amount insured, \$1000. Ordinary life plan. Age at issue, 40. Reserve computed according to American Experience Table, with four per cent interest.

YEAR.	Reserve Portion of Premium.	Accumulated Re- serve at End of Year	Net Amount at Risk.
1st.....	\$13.06	\$13.59	\$986.41
2d.....	12.99	27.65	972.35
3d.....	12.91	42.18	957.82
4th.....	12.82	57.20	942.80
5th.....	12.70	72.70	927.30
6th.....	12.57	88.68	911.32
7th.....	12.40	105.13	894.87
8th.....	12.22	122.05	877.95
9th.....	12.00	139.41	860.59
10th.....	11.73	157.19	842.81
11th.....	11.43	175.37	824.63
12th.....	11.08	193.91	806.09
13th.....	10.71	212.80	787.20
14th.....	10.29	232.02	767.98
15th.....	9.83	251.52	748.48
16th.....	9.34	271.30	728.70
17th.....	8.80	291.31	708.69
18th.....	8.23	311.52	688.48
19th.....	7.65	331.91	668.09
20th.....	6.96	352.42	647.58
etc.	etc.	etc.	etc.

Premiums are sometimes paid, by consent of the company, partly in cash and partly in notes. These notes are available as a part of the reserve. The cash part of the premium is used to pay expenses and current losses, and the note is laid away as part of the reserve. Such notes are called "premium notes" and in reality constitute a loan to the policyholder. The premium note system has not proved a very satisfactory one. The notes accumulate and finally constitute a considerable lien upon the insurance, which is deducted from the amount of the insurance in case

of claim. In companies whose dividends are large, the accumulation of these notes is diminished by applying the dividends towards their payment. There are very few companies at present which use the note system.

Policies having a large reserve value are sometimes used as collateral for loans. Their main value for such purpose lies in the reserve. The insurance itself is payable only upon the happening of a certain contingency, *i. e.*, the death of the insured, and, of course, constitutes a very indefinite form of security. Endowments (policies payable when the insured reaches a certain age, or at prior death) are more available as collateral security, but even here the definite value of the collateral is largely dependent upon the amount of the reserve.

The amount of money allowed by a company for the surrender of a policy is governed by the reserve, unless the insured is in poor health. In that case the prospect of his early death, which would make the policy a claim for the full amount of the insurance, would give an added present value to the policy. It is evident, however, that, if the insured be in good health, the reserve on his policy represents his entire equity in the insurance, since the remaining portion of his premiums has been used for the payment of current losses and expenses.

Usually companies do not allow the full reserve as a surrender value, but deduct from it a "surrender charge," as it is called. This charge varies in amount. The Massachusetts non-forfeiture law allows 20 per cent.

In cases of reinsurance, the reserve is again the important element of the transaction. If a company wishes or is forced to withdraw from business, it sometimes reinsures its risks, *i. e.*, transfers them to another company. This latter company assumes the contracts of the former, and charges

the same premium for the insurance which each policyholder was paying the original company. To enable it to do this, the reserve fund accumulated by the original company must be transferred to the reinsuring company, else the latter company would be the loser by the transaction, by at least the deficiency of the reserve. Consequently, a company which has impaired its reserve to any considerable extent cannot reinsure its risks.

The reserve is sometimes called the "reinsurance" reserve.



CHAPTER VI.

SURPLUS ; DIVIDENDS.

The surplus of a company is the excess of its assets over its liabilities. The former include such real estate as the company may own, cash on hand and in course of transmission, stocks, bonds, mortgage loans, loans on collaterals, premium notes, accrued rents and interest, and deferred premiums less the loading. The liabilities include the reserve, unpaid death claims and all unpaid bills or current obligations. The reserve will be the largest item of liability unless the company has been doing business but a very short time. If it is calculated upon a $4\frac{1}{2}$ per cent basis it will be smaller than if upon a 4 per cent basis. Consequently, the *surplus* at $4\frac{1}{2}$ per cent will be larger than at 4 per cent, by exactly the difference between a 4 per cent and a $4\frac{1}{2}$ per cent reserve. In some of the older and larger companies this difference amounts to several million dollars.

The sources of surplus in any company are three, viz. :
A lower rate of mortality than was assumed in the computation of the premiums ;

A higher rate of interest, actually received, than was assumed in that computation ; and

The use of a less amount of money for expenses than was provided for by the loading of the premiums.

If exactly the tabular rate of mortality were experienced, exactly the assumed rate of interest were realized, and ex-

actly the amount of the loading were used for expenses, the company would at all times have its reserve on hand, but not a dollar of surplus. (Surplus and reserve should be carefully distinguished. They are entirely separate and distinct. One is an asset, the other a liability. One can be used for such purposes as the company thinks best. The other can be used only in the payment of claims under policies which have contributed to it, and in exact proportion to the amount of such contribution.)

The rate of mortality in any well-managed company should be less than the assumed or tabular rate.

The rate of interest has for many years averaged more than 4 per cent. For at least ten years subsequently to 1865 it averaged 8 per cent. Its constant tendency, however, is to become lower. Consequently, one exceedingly important factor in producing surplus in earlier years has grown less and less important in later years.

The amount used for expenses ought not to equal the loading in any company which has a considerable amount of business, especially if the premiums are heavily loaded.

After retaining a surplus sufficiently large to provide for contingencies, it is customary among companies which issue policies on the mutual or participating plan to divide the remainder of the surplus among such of its policyholders as are entitled to share in it. This is, in reality, the return of

NOTE.—Formerly, if a policy “lapsed”—became void for non-payment of premium when due—the entire accumulated reserve was forfeited to the company, and from this source no inconsiderable additions were made to the surplus. Now, however, a more equitable practice prevails, and the additions to the surplus from forfeiture of reserves on lapsed policies are at present less than formerly. In general, the most considerable gain to surplus from lapsed policies, at present, arises from forfeitures of contingent dividends under the “Tontine” system as explained on page 39.

an overcharge, but it is customary to call it the payment of a dividend.

The principal plans upon which dividends are distributed are the percentage plan and the contribution plan. The former allows dividends as a percentage, either on the amount of the insurance or on the sum of all premiums paid. The latter takes account of the sources of surplus and of the amount which each individual policy has contributed. For example: if the mortality has been but 80 per cent of the tabular rate, 20 per cent of the *cost* of the insurance under A's policy is credited to him; if interest has been 6 per cent, instead of 4 per cent, 2 per cent upon the reserve under his policy is also credited A; if the expenses have been 90 per cent of the loading, 10 per cent of the loading of A's premium is also credited him. The sum of these three items is the amount of the dividend received by A. This plan, now almost universally adopted, was devised by Mr. Sheppard Homans, assisted by Mr. D. P. Fackler.

Dividends are paid sometimes in cash, sometimes in reduction of the next year's premium, sometimes by the addition of a certain amount of insurance to the original amount of the policy. In the latter case they are known as "reversionary" dividends.

The frequency with which the accumulated surplus is divided, and, consequently, the periods at which dividends are declared, vary with different forms of policies and the practice of different companies. Sometimes dividends are paid annually. In other instances, as under policies written upon the twenty-year distribution plan, they are paid once in twenty years, and only upon such policies as are then in force.

CHAPTER VII.

PLANS OF INSURANCE.

The words "insurance" and "policy" are often used interchangeably, thus: "An insurance of five thousand dollars," or "A policy of five thousand dollars."

LIFE POLICIES.

A policy payable only upon the death of the insured is known as a life policy. When the premiums are paid annually (or in semi-annual or quarterly installments) during the lifetime of the insured, the policy is called an ordinary, whole-life policy.

When the payments are to be completed in a given number of years, the term limited-payment life policy is used. Or, the exact term is mentioned as "ten-payment life," "fifteen-payment life," etc. The payment of a single premium constitutes a single-payment life policy. Of course, all limited-payment premiums are higher than ordinary premiums, since the equivalent of payments during a lifetime must be contained in the limited number of payments made. Consequently, the reserve or self-insurance element is also larger. Joint-life policies are contingent upon two lives, both of which are insured under one policy, the insurance being payable to the survivor upon the death of either. The premium is higher than that upon a single life, but is not equal to the sum of the full premiums on both lives. Policies of this form are not in favor with American companies at the present time,

Very intricate calculations are involved in the computation of joint-life premium rates.

Term insurance is insurance covering a specified term. This provides for payment on account of such deaths only as occur during the term. The example on page 23 is an illustration of a five-year, term insurance. As will be seen by examination, out of 78,106 persons living at age 40, only 3933 will die during the succeeding five years. If the term of the insurance, then, is limited to five years, the premium need be only large enough to provide for 3933 deaths, while a whole-life insurance would require provision for 78,106 deaths. The term premium is consequently lower. When the policy provides for insurance for a specified term, with the privilege of renewing the insurance at the end of that term for another similar term, upon payment of a premium adjusted to the cost of each successive term, it is called a renewable term policy. The length of the term is indicated by such nomenclature as "yearly renewable term," or "ten-year renewable term."

ANNUITIES.

These policies provide for the payment of a certain yearly sum to the insured, or to the beneficiary named in the policy, during the life-time of the annuitant. The premium may be paid in one payment, or in annual payments for a given number of years. Its amount depends upon the relative ages of the insured and the annuitant. Thus if A, being 25 years old, insures his life for the benefit of his mother, 60 years old, with the understanding that the insurance is to be an annuity, payable, in the event of his death, during the remainder of his mother's life, the premium would be very small. For the probability is that A will survive his mother—in which case the company

would have to pay nothing—or, in any event, that he will pay a considerable number of premiums to the company, while his mother will not live many years after his death to receive her annuity. On the contrary, if B, the insured, were an old man, and his daughter, the beneficiary, were young, the chance would be that B would pay comparatively few premiums, while the daughter would survive him many years to receive her annual stipend. In such a case, the premium would be very high. Annuities, while quite popular in Europe, are little sought after in this country.

ENDOWMENTS.

An endowment, pure and simple, is an agreement to pay a certain sum of money when the insured shall have reached a certain age. This form unmodified is almost never used, but there is added to it an agreement to pay the sum insured if the person insured shall die before reaching the specified age. Thus, an endowment assurance of \$1000 at 60 means that the company will pay \$1000 if the insured reaches the age of 60, or upon his death at any time before that. The premium therefore must be the sum of two premiums, one covering the insurance for the term, and the other providing for the endowment at the end of the term.

Endowments are sometimes classified by the age which the insured must attain in order to receive the amount of the policy; thus, an “endowment at 60,” an “endowment at 70.” They are more commonly classified by the term covered. Thus, an endowment on a life, age 40, payable at age 55, would be called a “15-year endowment.” If a premium was to be paid each year during this term, the policy would be called an “ordinary 15-year endowment.” If, however, the premiums were to be paid in 10 years, the

policy would be called a "ten-payment, 15-year endowment."

The rate of premium is, of course, determined by the length of the endowment term and the number of payments.

RETURN PREMIUM POLICIES, SIX PER CENT BOND POLICIES, ETC.

Some forms of policies stipulate that upon the death of the insured the amount of the premiums paid by him shall be returned in addition to the amount named in the policy. Other policies guarantee the payment of the amount of the insurance with 6 per cent interest thereon. Of course, in either case and in all similar cases, the addition to the amount named in the policy is just so much additional insurance, and an additional premium must be, and always is, charged therefor.

TONTINES.

In 1648, Lorenzi Tonti organized a fund in Naples, the conditions of which were as follows: Each subscriber paid a certain sum of money into the fund. The total fund was invested, and the interest on the amount of each subscription was paid, during the lifetime of the subscriber, to such person as he named. At the death of a subscriber his subscription was forfeited to the fund, and the interest thereon was divided among the subscribers, who, for this purpose, were divided into classes according to age. At the death of the last subscriber the entire capital subscribed reverted to the crown.

It will be seen that this is the opposite of life insurance, since those who live longest receive the greatest benefits. The principle of forfeiture on the part of those who die and

NOTE.—An ordinary life policy is practically an endowment at age 96.

of accumulation for those who survive, is known as the "Tontine" principle. This was first applied to life insurance as follows:

It is evident that a policyholder who has paid premiums for several years and then given up his insurance, paying no further premiums, leaves in the hands of the company the reserve credited to his policy, and also any share in the surplus which might fairly be considered his, but which has not been actually paid to him in the form of dividends. The entire amount of this reserve and of this surplus was credited by the company to the other policies of the same form and class. If any policy became a death claim the face of the policy only was paid, and any accrued but undivided surplus thereunder was credited in like manner. Finally, at the end of a specified number of years, known as the Tontine period, the gains from these sources were divided among the holders of such policies, of this form and class, as then remained in force. This practice has been modified so that in most cases the Tontine principle is now applied to surplus only, the retiring policyholder receiving an equitable consideration in paid-up insurance (see page 42) for his reserve. Of course, with the same amount of lapses, the returns to persistent policyholders under present Tontine policies are not, and cannot be, so large as they were when the retiring policyholder forfeited his entire reserve as well as his accrued and unpaid surplus. The Tontine principle is applicable to any form of policy written upon mutual or participating premiums. The methods of application are quite numerous, and the policies are variously designated as, Semi-Tontine, Free Tontine, Five, Ten, Fifteen or Twenty-year Distribution policies, etc. The extent to which the principle is applied and the amount of the return which may reasonably be expected therefrom, can be determined only from a knowledge of the terms and conditions of the policy in each case.

CHAPTER VIII.

*LAPSED POLICIES AND PAID-UP
INSURANCE.*

If a policy ceases to be in force solely because a stipulated premium is not paid, it is said to lapse. The question arises, what ought to be done with the reserve credited to that policy, which is practically a deposit made with the company by the policyholder in excess of the actual *cost* of the insurance to date. In the earlier history of life insurance, the entire reserve was forfeited to the company in case of lapse. At the present time, the fairer practice of recognizing the policyholders' equity in this fund is universal. Under the old practice, if the reserve on a policy was more than equal to the present value of the profit which the company might hope to make out of the future premiums on the policy, the lapse of that policy was a source of profit to the company. Now, however, the profit arising from lapses is almost nothing, and the lapse of a policy on any but a seriously impaired life is simply a matter of loss to the company.

In deciding what to do with the reserve on a lapsed policy, two things must be borne in mind:

First. The man who is in sound health will be likelier to let his policy lapse than the man who has reason to fear that his health is impaired and his chance of life shortened. Consequently, in this respect, the "selection," as it is termed, will always be against the company. As a matter

of self-protection, and, in fact, of equity between the retiring policyholder and those who remain, it is but right that the company should retain a reasonable portion of the reserve. The amount so retained is called a "surrender charge."*

Second. It may not always be convenient for a company to return the reserve in cash. It is necessary that the company should obtain a certain rate of interest on its investments, and it cannot afford to keep on hand too large an amount of uninvested money. Investments must also be made in the best class of securities and in those having a long time to run. Consequently, no reasonable man can expect an insurance company to hold itself in readiness to return in cash, and at any time, the reserves on lapsed policies.

Some companies do agree, however, to pay a certain portion of the reserve in cash at stated intervals. Thus, if a policy lapses at the end of the fifth, tenth or fifteenth year, the stipulated amount may be paid in cash.

The usual method, however, is to treat the reserve, less the proper surrender charge, as a single premium, either to continue the full amount of the insurance for such a term as this single premium will cover, or to buy paid-up insurance of a less amount. In the former case, if the death of the insured occurs during the term of the "extended" insurance, the full amount of the policy is paid, but when the term expires the insurance is ended. In the latter case, the reduced amount of the paid-up policy is paid whenever the death occurs.

To find approximately the value of a whole-life reserve in paid-up whole-life insurance, take 80 per cent of the reserve and divide it by the single premium given in the table on

* The Massachusetts "non-forfeiture" law allows a surrender charge of 20 per cent of the reserve.

page 57, *for the age attained by the policyholder at the time of lapse.*

To find the term of the extended insurance is not so easy. The Massachusetts non-forfeiture law with the tables published by the Massachusetts Insurance Commissioner, and also the tables published by several companies, are the best guide.

On all limited-payment policies it is customary to give paid-up insurance for as many proportionate parts of the original amount as there have been premiums paid. Thus 4 premiums paid on a ten-payment life policy of \$1000 would secure paid-up insurance of \$400 payable at death; 7 premiums paid on a ten-payment endowment of \$1000 at 60 would secure a paid-up endowment of \$700 payable at 60.



CHAPTER IX.

CERTAIN CONDITIONS IN POLICY CONTRACTS.

Payments of Premiums.—Premiums are always payable at the home office of the company, but, for the convenience of the policyholder, are allowed to be paid at some bank or agency near him. Prompt payment of premiums is also required. In actual practice, this is often waived, although there would seem to be no good reason why the insured should not pay his premiums with the same promptness which he expects and demands from the company in the payment of its losses.

Residence and Occupation.—The conditions of policies in regard to these matters are usually exceedingly liberal. Residents in notoriously unhealthy localities, or persons engaged in extra-hazardous occupations, would not be insured by any company at the usual rates of premium. Policies provide that, after being insured at the usual rate, the policyholder shall not reside in such localities or engage in such occupations without first obtaining the company's consent and paying an extra premium therefore. The written consent of the company is called a "permit."

Use of Stimulants and Narcotics.—Policies often provide that the insured shall not indulge in the use of stimulants or narcotics to such an extent as to impair his health or shorten his life.

Suicide.—The practice of different companies differs as to suicide. Some policies provide that death by suicide, whether the insured be sane or insane, shall not constitute

a claim against the company. In others, death by suicide from insanity is treated as the natural termination of the disease. In others, no reference is made to suicide.

Non-Forfeiture.—As already stated, nearly every company now allows some equitable return, in the way of paid-up or extended insurance, for the reserve left in its hands by the lapse of a policy. Provision for this is made by the terms of the policy, and consequently this equity is not forfeited by failure to pay a stipulated premium.

Incontestability.—Many policies provide that, subject to the conditions of the policy in regard to residence, occupation, and the payment of premiums, the insurance shall be incontestable after a certain number of years (two or three), except for fraud in obtaining the policy. Sometimes this last clause is omitted. The general effect of the provision, however worded, is to waive, in case of claim against the company after the specified term, all defenses of a merely technical nature, or such as might be based upon misstatements in the application, made without fraudulent intent. No company can so effectually waive its right to contest a fraud, as to be estopped from making such defense if good grounds for it exist. The sensible man will undoubtedly admit that there is no more reason why attempted fraud upon an insurance company should not be resisted, than there is for non-resistance to any other form of fraud. Attempts of this sort sometimes occur, and are either fought out in the courts or settled by compromise as a matter of expediency. Resistance to such claims is always creditable to a company, and should have the support of agents and policyholders. On the other hand, the fact that a company *frequently* resists the payment of claims or forces compromises, may be accepted without hesitation as proof that something is wrong in the management.

CHAPTER X.

APPLICATIONS; RISKS; MEDICAL EXAMINERS.

When a person desires insurance, he makes application therefor upon printed forms furnished by the company. It is intended that this form, when properly filled out and accompanied by the report of the Medical Examiner, shall furnish the company with information which will enable it to decide whether or not the applicant is a desirable risk. His family history as to longevity, existence of hereditary diseases, etc.; his own personal history as to health or disease, residence, occupation, etc.; his present residence and occupation, and, last but not least, his present physical condition, must all be taken into the account.

It is here that the Medical Examiner plays a most important part. It is his duty to ascertain the present physical condition of the applicant, and from the results of his examination, together with the personal and family history of the applicant, to determine the probability of a long or short life, and consequently to recommend or reject the risk. No one performs a more important duty in connection with the whole business of life insurance. If Medical Examiners are incompetent or careless, the best plans of insurance and the ablest management will end in nothing but disaster. The fact that not one of the important failures of life insurance companies in this country has

been due primarily to excessive mortality, speaks volumes for the skill and fidelity of the Medical Examiners.

It might appear, at first sight, that a rigid medical examination should result in a large saving to the companies by securing for them an exceedingly low rate of mortality. It is true that the rate is generally very low for a year or two among newly selected risks, but the effect of the medical selection disappears more rapidly than is usually supposed, and but a comparatively short time elapses before the average normal rate is experienced. The very low cost of insurance in assessment organizations, newly organized, is due to the fact that the risks are newly selected, but it is idle to expect that the cost can be kept down to that point by the infusion of "new blood," or by any other process.

If impaired or doubtful risks were not summarily rejected, the selection against the company, already alluded to, would assert itself at the very outset. The better class of lives would drop out, and the company would find itself overwhelmed by the mortality among the poorer risks remaining.

Companies have been formed for the insurance of impaired lives at an adequate rate of premium. It has been found very difficult, however, to determine what premiums are adequate, and the experiments in this direction have never proved successful.



CHAPTER XI.

ANNUAL STATEMENTS; RATIOS.

The laws of the different States require companies to file annually statements of their transactions during the preceding year, and of their financial condition at the close of the year. The forms prescribed by the Insurance Departments of the various States are very complete. The results in detail are published in the annual reports of the Departments, and are frequently accompanied by tables of percentages and ratios. In determining the value of these, some knowledge of the business of life insurance, and more common sense, are necessary. For instance:

Percentage of expenses to income is not always a reliable standard by which to judge economy of management. Premiums may be very heavily loaded for certain forms of insurance, and the current year's expenses may exhaust but a small part of that loading. Or the investment part of the premiums may be very large, and the premiums, consequently, very high. The amount used for expenses would, in either case, constitute but a comparatively small percentage of the gross premiums. On the other hand, the loading, or the investment part, or both, of premiums may be very small, in which case, although expenses may be kept within the loading, they may still constitute a comparatively large percentage of the premiums. Consequently

equal economy of management will not necessarily result in the same, or even nearly the same, percentage of expense to premium income.

The ratio of assets to liabilities is of little consequence until both assets and liabilities have reached respectable proportions. If A has but one dollar in the world, and owes nothing, the ratio of his assets to his liabilities is infinity. If B, however, is worth \$200,000, and owes \$100,000, the ratio of his assets to his liabilities is only two to one. Of course, after a company has been in business for a number of years and has placed a large amount of insurance on its books, the percentage of its assets to its liabilities is a question of the highest importance.

The percentage of death losses to the mean amount insured during the year affords the basis of a fairly close estimate of a company's mortality experience. But an exact determination of that experience cannot be made without a knowledge of the ages of all the persons insured, and consequently of the percentage of mortality expected by the company and provided for in the premium charges.

The percentage of interest (including rents and profits on sales of stocks, bonds and real estate) to mean amount of assets, is important. If premiums are calculated and reserves held upon a basis of 4 per cent, that rate, at least, ought actually to be realized.

The ratio of expenses to amount of new business secured may be of much or little importance, depending entirely upon the proportion of expense fairly chargeable to the securing of new business, as well as upon the provision for that expense made in the premiums charged.

The ratio of assets to amount of insurance in force is of little value, the main question always being whether present accumulations, together with future premiums,

are sufficient to provide for future claims. If future premiums alone are sufficient, the question of present accumulation is of no consequence.

And so on. Persons of a statistical turn of mind are constantly furnishing tables of ratios and percentages, comparative tables, etc., etc. Most of the statistics thus compiled are interesting, many of them are valuable, a few are vital. Anyone well grounded in the elementary principles of life insurance, and fairly familiar with the practical workings of the business, can decide for himself to which class belong such statistics as come under his observation.

“EXPECTATION” TABLE.—ASSURED LIVES.

(Constructed from the American Experience Table of Mortality.)

AGE.	Expecta- tion, Years.	AGE.	Expecta- tion, Years.	AGE.	Expecta- tion, Years.
10.....	48.7	37.....	30.4	64.....	11.7
11.....	48.1	38.....	29.6	65.....	11.1
12.....	47.4	39.....	28.9	66.....	10.5
13.....	46.8	40.....	28.2	67.....	10.0
14.....	46.2	41.....	27.5	68.....	9.5
15.....	45.5	42.....	26.7	69.....	9.0
16.....	44.9	43.....	26.0	70.....	8.5
17.....	44.2	44.....	25.3	71.....	8.0
18.....	43.5	45.....	24.5	72.....	7.6
19.....	42.9	46.....	23.8	73.....	7.1
20.....	42.2	47.....	23.1	74.....	6.7
21.....	41.5	48.....	22.4	75.....	6.3
22.....	40.9	49.....	21.6	76.....	5.9
23.....	40.2	50.....	20.9	77.....	5.5
24.....	39.5	51.....	20.2	78.....	5.1
25.....	38.8	52.....	19.5	79.....	4.8
26.....	38.1	53.....	18.8	80.....	4.4
27.....	37.4	54.....	18.1	81.....	4.1
28.....	36.7	55.....	17.4	82.....	3.7
29.....	36.0	56.....	16.7	83.....	3.4
30.....	35.3	57.....	16.1	84.....	3.1
31.....	34.6	58.....	15.4	85.....	2.8
32.....	33.9	59.....	14.7	86.....	2.5
33.....	33.2	60.....	14.1	87.....	2.2
34.....	32.5	61.....	13.5	88.....	1.9
35.....	31.8	62.....	12.9	89.....	1.7
36.....	31.1	63.....	12.3	90.....	1.4

AMERICAN EXPERIENCE TABLE OF MORTALITY.

AGE.	No. Living at Beginning of Year.	No. Dying During Year.	Percentage of Deaths During Year to No. Living at Beginning of Year.	AGE.	No. Living at Beginning of Year.	No. Dying During Year.	Percentage of Deaths During Year to No. Living at Beginning of Year.
10.....	100,000	749	.007490	53.....	66,797	1,091	.016333
11.....	99,251	746	.007516	54.....	65,706	1,143	.017396
12.....	98,505	743	.007543	55.....	64,563	1,199	.018571
13.....	97,762	740	.007569	56.....	63,364	1,260	.019885
14.....	97,022	737	.007596	57.....	62,104	1,325	.021335
15.....	96,285	735	.007634	58.....	60,779	1,394	.022936
16.....	95,550	732	.007661	59.....	59,385	1,468	.024720
17.....	94,818	729	.007688	60.....	57,917	1,546	.026693
18.....	94,089	727	.007727	61.....	56,371	1,628	.028880
19.....	93,362	725	.007765	62.....	54,743	1,713	.031292
20.....	92,637	723	.007805	63.....	53,030	1,800	.033943
21.....	91,914	722	.007855	64.....	51,230	1,889	.036873
22.....	91,192	721	.007906	65.....	49,341	1,980	.040129
23.....	90,471	720	.007958	66.....	47,361	2,070	.043707
24.....	89,751	719	.008011	67.....	45,291	2,158	.047647
25.....	89,032	718	.008065	68.....	43,133	2,243	.052002
26.....	88,314	718	.008130	69.....	40,850	2,321	.056762
27.....	87,596	718	.008197	70.....	38,569	2,391	.061993
28.....	86,878	718	.008264	71.....	36,178	2,448	.067665
29.....	86,160	719	.008345	72.....	33,730	2,487	.073733
30.....	85,441	720	.008427	73.....	31,243	2,505	.080178
31.....	84,721	721	.008510	74.....	28,738	2,501	.087028
32.....	84,000	723	.008607	75.....	26,237	2,476	.094371
33.....	83,277	726	.008718	76.....	23,761	2,431	.102311
34.....	82,551	729	.008831	77.....	21,330	2,369	.111064
35.....	81,822	732	.008946	78.....	18,961	2,291	.120827
36.....	81,090	737	.009089	79.....	16,670	2,196	.131734
37.....	80,353	742	.009234	80.....	14,474	2,091	.144466
38.....	79,611	749	.009408	81.....	12,383	1,964	.158605
39.....	78,862	756	.009586	82.....	10,419	1,816	.174297
40.....	78,106	765	.009794	83.....	8,603	1,648	.191561
41.....	77,341	774	.010008	84.....	6,955	1,470	.211359
42.....	76,567	785	.010252	85.....	5,485	1,292	.235552
43.....	75,782	797	.010517	86.....	4,193	1,114	.265681
44.....	74,985	812	.010829	87.....	3,079	933	.303020
45.....	74,173	828	.011163	88.....	2,146	744	.346692
46.....	73,345	848	.011562	89.....	1,402	555	.395863
47.....	72,497	870	.012000	90.....	847	385	.454545
48.....	71,627	896	.012509	91.....	462	246	.532466
49.....	70,731	927	.013106	92.....	216	137	.632259
50.....	69,804	962	.013781	93.....	79	58	.734177
51.....	68,842	1,001	.014541	94.....	21	18	.857143
52.....	67,841	1,044	.015389	95.....	3	3	1.000000

ACTUARIES' OR COMBINED EXPERIENCE TABLE
OF MORTALITY.

The following table was prepared by a committee of eminent actuaries on the data afforded by the combined experience of seventeen of the principal life insurance offices in England. It was deduced from 62,537 assurances. Some of the objections advanced against it are that certain lives have been more than once assured, have appeared twice or oftener as elements of the calculation, and that the data for the older ages were insufficient. The average duration of all the policies was a little less than eight and a half years. The later Actuaries' or H. M. (healthy males) Table is now more generally used in England. The American Experience Table furnishes a better standard than either for American lives :

AGE.	Number Living at the Beginning of the Year.	Number Dying During the Year.	Percentage of Deaths During the Year to Number Living at the Beginning of the Year.	AGE.	Number Living at the Beginning of the Year.	Number Dying During the Year.	Percentage of Deaths During the Year to Number Living at the Beginning of the Year.
10.....	100,000	676	.006760	25.....	89,835	698	.007770
11.....	99,324	674	.006786	26.....	89,137	703	.007887
12.....	98,650	672	.006812	27.....	88,434	708	.008006
13.....	97,978	671	.006848	28.....	87,726	714	.008139
14.....	97,307	671	.006896	29.....	87,012	720	.008275
15.....	96,636	671	.006944	30.....	86,292	727	.008425
16.....	95,965	672	.007003	31.....	85,565	734	.008578
17.....	95,293	673	.007062	32.....	84,831	742	.008747
18.....	94,620	675	.007134	33.....	84,089	750	.008919
19.....	93,945	677	.007206	34.....	83,339	758	.009095
20.....	93,268	680	.007291	35.....	82,581	767	.009288
21.....	92,588	683	.007377	36.....	81,814	776	.009485
22.....	91,905	686	.007464	37.....	81,038	785	.009687
23.....	91,219	690	.007564	38.....	80,253	795	.009906
24.....	90,529	694	.007666	39.....	79,458	805	.010131

ACTUARIES' OR COMBINED EXPERIENCE TABLE OF MORTALITY.

(Continued from preceding page.)

AGE.	Number Living at the Beginning of the Year.	Number Dying During the Year.	Percentage of Deaths During the Year to Number Living at the Beginning of the Year.	AGE.	Number Living at the Beginning of the Year.	Number Dying During the Year.	Percentage of Deaths During the Year to Number Living at the Beginning of the Year.
40	78,653	815	.010362	70	35,837	2,327	.064933
41	77,838	826	.010512	71	33,510	2,351	.070158
42	77,012	839	.010894	72	31,159	2,362	.075805
43	76,173	857	.011251	73	28,797	2,358	.081884
44	75,316	881	.011697	74	26,439	2,339	.088468
45	74,435	909	.012212	75	24,100	2,303	.095560
46	73,526	944	.012839	76	21,797	2,249	.103179
47	72,582	981	.013517	77	19,548	2,179	.111469
48	71,601	1,021	.014260	78	17,369	2,092	.120444
49	70,580	1,063	.015061	79	15,277	1,987	.130065
50	69,517	1,108	.015939	80	13,290	1,866	.140406
51	68,409	1,156	.016898	81	11,424	1,730	.151436
52	67,253	1,207	.017947	82	9,694	1,582	.163194
53	66,046	1,261	.019093	83	8,112	1,427	.175912
54	64,785	1,316	.020313	84	6,685	1,268	.189678
55	63,469	1,375	.021664	85	5,417	1,111	.205095
56	62,094	1,436	.023126	86	4,306	958	.222480
57	60,658	1,497	.024679	87	3,348	811	.242234
58	59,161	1,561	.026386	88	2,537	673	.265274
59	57,600	1,627	.028247	89	1,864	545	.292382
60	55,973	1,698	.030336	90	1,319	427	.323730
61	54,275	1,770	.032612	91	892	322	.360987
62	52,505	1,844	.035120	92	570	231	.405263
63	50,661	1,917	.037840	93	339	155	.457227
64	48,744	1,990	.040826	94	184	95	.516304
65	46,754	2,061	.044082	95	89	52	.584270
66	44,693	2,128	.047614	96	37	24	.648640
67	42,565	2,191	.051474	97	13	9	.692308
68	40,374	2,246	.055630	98	4	3	.750000
69	38,128	2,291	.060087	99	1	1	1.000000

ORDINARY, CONTINUED-PAYMENT, WHOLE-LIFE.

NET VALUE, OR RESERVE OF A PREMIUM-PAYING POLICY OF
\$1000, AT THE END OF VARIOUS YEARS, ACTUARIES'
TABLE, 4 PER CENT

AGE AT ISSUE.	1st Year.	2d Year.	3d Year.	4th Year.	5th Year.	6th Year.	7th Year.	8th Year.
	\$	\$	\$	\$	\$	\$	\$	\$
25.....	7.60	15.45	23.56	31.94	40.58	49.51	58.73	68.24
26.....	7.91	16.09	24.52	33.24	42.24	51.52	61.11	71.00
27.....	8.24	16.75	25.53	34.60	43.96	53.62	63.59	73.89
28.....	8.58	17.43	26.58	36.02	45.76	55.81	66.20	76.92
29.....	8.93	18.16	27.68	37.50	47.64	58.12	68.93	80.09
30.....	9.31	18.91	28.83	39.06	49.63	60.54	71.80	83.45
31.....	9.70	19.70	30.03	40.70	51.71	63.08	74.84	86.98
32.....	10.11	20.54	31.31	42.43	53.91	65.78	78.04	90.72
33.....	10.54	21.42	32.65	44.25	56.25	68.63	81.43	94.67
34.....	11.00	22.35	34.07	46.20	58.71	71.65	85.03	98.86
35.....	11.48	23.33	35.59	48.25	61.34	74.86	88.84	103.29
36.....	11.99	24.39	37.19	50.43	64.11	78.26	92.87	107.92
37.....	12.55	25.51	38.90	52.75	67.08	81.87	97.09	112.71
38.....	13.12	26.69	40.72	55.22	70.20	85.62	101.43	117.61
39.....	13.74	27.96	42.65	57.83	73.46	89.48	105.88	122.59
40.....	14.41	29.31	44.70	60.55	76.79	93.42	110.36	127.60
41.....	15.12	30.73	46.81	63.29	80.16	97.35	114.85	132.64
42.....	15.85	32.18	48.91	66.04	83.49	101.26	119.32	137.69
43.....	16.59	33.59	51.00	68.73	86.78	105.13	123.80	142.74
44.....	17.30	34.99	53.02	71.38	90.04	109.02	128.28	147.80
45.....	18.01	36.36	55.04	74.03	93.34	112.94	132.80	152.91
46.....	18.69	37.71	57.05	76.72	96.67	116.90	137.38	158.08
47.....	19.39	39.10	59.14	79.47	100.09	120.95	142.05	163.37
48.....	20.10	40.54	61.28	82.30	103.57	125.09	146.83	168.78
49.....	20.86	42.02	63.47	85.19	107.14	129.34	151.73	174.30
50.....	21.62	43.52	65.70	88.13	110.79	133.67	156.72	179.95
51.....	22.39	45.06	67.98	91.14	114.53	138.09	161.84	185.74
52.....	23.19	46.63	70.33	94.24	118.34	142.64	167.09	191.66
53.....	24.00	48.26	72.74	97.42	122.29	147.32	172.47	197.66
54.....	24.85	49.94	75.22	100.70	126.35	152.12	177.93	203.75
55.....	25.72	51.65	77.78	104.08	130.51	156.98	183.46	209.87
56.....	26.61	53.43	80.42	107.55	134.72	161.90	189.01	216.02
57.....	27.56	55.29	83.15	111.07	138.99	166.84	194.59	222.18
58.....	28.52	57.18	85.88	114.59	143.23	171.76	200.14	228.28
59.....	29.50	59.05	88.60	118.08	147.46	176.66	205.63	234.30
60.....	30.45	60.90	91.28	121.54	151.63	181.49	211.02	240.21

ORDINARY, CONTINUED-PAYMENT, WHOLE-LIFE.

NET VALUE, OR RESERVE OF A PREMIUM-PAYING POLICY OF
\$1000, AT THE END OF VARIOUS YEARS, ACTUARIES'

TABLE, 4 PER CENT.

(Continued from preceding page.)

AGE AT ISSUE.	9th Year.	10th Year.	15th Year.	20th Year.	25th Year.	30th Year.	35th Year.	40th Year.
	\$	\$	\$	\$	\$	\$	\$	\$
25.....	78.06	88.20	144.12	209.84	283.60	362.97	446.11	530.09
26.....	81.22	91.76	149.99	218.13	293.72	374.60	458.86	543.16
27.....	84.52	95.50	156.17	226.62	304.03	386.39	471.67	556.13
28.....	87.99	99.43	162.65	235.31	314.51	398.34	484.52	569.00
29.....	91.64	103.56	169.41	244.20	325.18	410.44	497.38	581.75
30.....	95.48	107.91	176.42	253.29	336.02	422.68	510.21	594.38
31.....	99.53	112.51	183.65	262.57	347.02	434.99	523.01	606.86
32.....	103.82	117.37	191.06	272.02	358.17	447.38	535.72	619.17
33.....	108.36	122.50	198.65	281.64	369.49	459.80	548.34	631.31
34.....	113.15	127.86	206.39	291.42	380.94	472.23	560.83	643.26
35.....	118.16	133.41	214.30	301.35	392.53	484.64	573.20	655.01
36.....	123.35	139.13	222.36	311.42	404.18	497.00	585.42	666.54
37.....	128.69	144.97	230.54	321.60	415.89	509.27	597.47	677.87
38.....	134.10	150.89	238.83	331.91	427.60	521.42	609.34	688.96
39.....	139.60	156.89	247.22	342.33	439.31	533.44	621.01	699.79
40.....	145.14	162.97	255.70	352.84	450.97	545.32	632.47	710.39
41.....	150.73	169.09	264.25	363.37	462.54	557.02	644.11	720.76
42.....	156.22	175.22	272.83	373.90	473.98	568.53	654.71	730.97
43.....	161.94	181.37	281.47	384.39	485.29	579.85	665.47	741.10
44.....	167.56	187.54	290.19	394.86	496.45	590.97	675.99	751.23
45.....	173.24	193.79	299.01	405.30	507.49	601.90	686.30	761.48
46.....	179.12	200.13	307.89	415.71	518.41	612.65	696.43	771.90
47.....	184.90	206.59	316.86	426.07	529.23	623.26	706.46	782.51
48.....	190.90	213.19	325.89	436.37	539.92	633.69	716.50	793.36
49.....	197.06	219.95	334.98	446.62	550.49	643.93	726.61	804.39
50.....	203.34	226.84	344.07	456.79	560.91	654.00	736.93	815.50
51.....	209.76	233.82	353.18	466.88	571.20	663.94	747.48	826.66
52.....	216.27	240.88	362.24	476.87	581.36	673.82	758.32	837.76
53.....	222.86	248.00	371.25	486.76	591.36	683.74	769.48	848.52
54.....	229.51	255.18	380.21	496.55	601.20	693.81	780.92	858.60
55.....	236.19	262.35	389.11	506.21	610.89	704.15	792.51	867.73
56.....	242.87	269.52	397.92	515.79	620.47	714.83	804.24	874.74
57.....	249.54	276.63	406.65	525.16	630.03	725.88	815.99	879.66
58.....	256.13	283.65	415.26	534.43	639.68	737.37	827.41	887.71
59.....	262.63	290.58	423.74	543.52	649.52	749.24	838.15	906.81
60.....	269.02	297.42	432.09	552.49	659.75	761.42	847.87	1,000.00

PRESENT VALUE OF \$1 DUE AT END OF YEAR IN FROM
ONE TO FORTY YEARS FROM THE PRESENT TIME.

NO. OF YEARS.	Four Per Cent.	Four and One-Half Per Cent.	Five Per Cent.	Six Per Cent.
1.....	.961538	.956938	.952381	.943396
2.....	.924556	.915730	.907029	.889996
3.....	.888996	.876297	.863838	.839618
4.....	.854804	.838561	.822702	.792094
5.....	.821927	.802451	.783526	.747258
6.....	.790315	.767896	.746215	.704961
7.....	.759918	.734828	.710681	.665057
8.....	.730690	.703185	.676839	.627412
9.....	.702587	.672904	.644609	.591898
10.....	.675564	.643928	.613913	.558395
11.....	.649581	.616199	.584679	.526788
12.....	.624597	.589664	.556837	.496969
13.....	.600574	.564272	.530321	.468839
14.....	.577475	.539973	.505068	.442301
15.....	.555265	.516720	.481017	.417265
16.....	.533908	.494469	.458112	.393646
17.....	.513373	.473176	.436297	.371364
18.....	.493628	.452800	.415521	.350344
19.....	.474642	.433302	.395734	.330513
20.....	.456387	.414643	.376889	.311805
21.....	.438834	.396787	.358942	.294155
22.....	.421955	.379701	.341850	.277505
23.....	.405726	.363350	.325571	.261797
24.....	.390121	.347703	.310068	.246979
25.....	.375117	.332731	.295303	.232999
26.....	.360689	.318402	.281241	.219810
27.....	.346817	.304691	.267848	.207368
28.....	.333477	.291571	.255094	.195630
29.....	.320651	.279015	.242946	.184557
30.....	.308319	.267000	.231377	.174110
31.....	.296460	.255502	.220359	.164255
32.....	.285058	.244500	.209866	.154957
33.....	.274094	.233971	.199873	.146186
34.....	.263552	.223896	.190355	.137912
35.....	.253415	.214254	.181290	.130105
36.....	.243669	.164525	.135282	.122741
37.....	.234297	.196199	.164436	.115793
38.....	.225285	.877501	.156605	.109239
39.....	.216621	.179665	.149148	.103056
40.....	.208289	.171929	.142046	.097222

NET PREMIUMS FOR A WHOLE-LIFE INSURANCE OF \$1000.

(Based upon the American Experience Table of Mortality with 4 per cent interest.)

AGE.	Single Premiums which are also Net Reserves on Paid-up Policies.	Annual Premiums during Life.	Annual Premiums for Twenty Years.	Annual Premiums for Ten Years.
15.....	\$229.68	\$11.47	\$17.32	\$28.12
16.....	233.01	11.68	17.58	28.53
17.....	236.48	11.91	17.85	28.96
18.....	240.10	12.15	18.13	29.41
19.....	243.86	12.40	18.42	29.87
20.....	247.77	12.67	18.73	30.36
21.....	251.85	12.95	19.05	30.87
22.....	256.08	13.24	19.38	31.39
23.....	260.47	13.54	19.72	31.94
24.....	265.04	13.87	20.08	32.51
25.....	269.79	14.21	20.46	33.10
26.....	274.74	14.57	20.85	33.72
27.....	279.87	14.95	21.26	34.36
28.....	285.21	15.35	21.68	35.03
29.....	290.75	15.77	22.13	35.72
30.....	296.51	16.21	22.59	36.45
31.....	302.50	16.68	23.08	37.20
32.....	308.71	17.18	23.59	37.98
33.....	315.17	17.70	24.12	38.80
34.....	321.86	18.25	24.67	39.64
35.....	328.81	18.84	25.26	40.53
36.....	336.02	19.46	25.87	41.45
37.....	348.50	20.12	26.51	42.40
38.....	351.24	20.82	27.18	43.40
39.....	359.27	21.57	27.88	44.44
40.....	367.57	22.35	28.68	45.51
41.....	376.17	23.19	29.41	46.64
42.....	385.06	24.08	30.24	47.81
43.....	394.25	25.03	31.11	49.03
44.....	403.75	26.04	32.03	50.30
45.....	413.55	27.12	33.00	51.63
46.....	423.66	28.27	34.04	53.01
47.....	434.06	29.50	35.14	54.46
48.....	444.76	30.81	36.30	55.97
49.....	455.74	32.21	37.55	57.54
50.....	466.99	33.70	38.86	59.19
51.....	478.48	35.29	40.27	60.90
52.....	490.21	36.98	41.76	62.69
53.....	502.15	38.79	43.36	64.55
54.....	514.31	40.73	45.06	66.49
55.....	526.65	42.79	46.88	68.52
56.....	539.15	45.00	48.84	70.65
57.....	551.81	47.35	50.93	72.87
58.....	564.59	49.87	53.17	75.20
59.....	577.48	52.57	55.59	77.64
60.....	590.46	55.45	58.18	80.22

ANNUAL PREMIUMS—ANALYSIS OF FIRST YEAR'S PREMIUM, AT
DIFFERENT AGES, \$1000 WHOLE-LIFE INSURANCE.
PARTICIPATING RATE.

AGE.	NET PREMIUMS, AMERICAN EXPERIENCE TABLE OF MORTALITY, WITH 4 PER CENT INTEREST.			Loading.	Gross or Office Premiums.
	Portion for Death Claims.	Portion for Reserve.	Total Net Premiums		
25.....	\$7.71	\$6.50	\$14.21	\$5.68	\$19.89
26.....	7.76	6.81	14.57	5.83	20.40
27.....	7.82	7.13	14.95	5.98	20.93
28.....	7.88	7.47	15.35	6.13	21.48
29.....	7.96	7.81	15.77	6.30	22.07
30.....	8.03	8.18	16.21	6.49	22.70
31.....	8.11	8.57	16.68	6.67	23.55
32.....	8.20	8.98	17.18	6.87	24.05
33.....	8.30	9.40	17.70	7.08	24.78
34.....	8.40	9.86	18.25	7.30	25.56
35.....	8.51	10.33	18.84	7.54	26.38
36.....	8.64	10.82	19.46	7.79	27.25
37.....	8.77	11.35	20.12	8.05	28.17
38.....	8.93	11.89	20.82	8.33	29.15
39.....	9.10	12.47	21.57	8.62	30.19
40.....	9.29	13.06	22.35	8.95	31.30
41.....	9.49	13.70	23.19	9.08	32.47
42.....	9.71	14.37	24.08	9.64	33.72
43.....	9.95	15.08	25.03	10.02	35.05
44.....	10.24	15.80	26.04	10.42	36.46
45.....	10.55	16.57	27.12	10.85	37.97
46.....	10.92	17.35	28.27	11.31	39.58
47.....	11.32	18.18	29.50	11.80	41.30
48.....	11.79	19.02	30.81	12.32	43.13
49.....	12.34	19.87	32.21	12.88	45.09
50.....	12.97	20.73	33.70	13.48	47.18
51.....	13.67	21.62	35.29	14.11	49.40
52.....	14.45	22.53	36.98	14.80	51.78
53.....	15.33	23.46	38.79	15.52	54.31
54.....	16.30	24.43	40.73	16.29	57.02
55.....	17.38	25.41	42.79	17.12	59.91
56.....	18.60	26.40	45.00	18.00	63.00
57.....	19.93	27.42	47.35	18.94	66.29
58.....	21.40	28.67	49.87	19.95	69.82
59.....	23.10	29.53	52.57	21.03	73.60
60.....	24.85	30.60	55.45	22.18	77.63

EXPLANATORY NOTES.

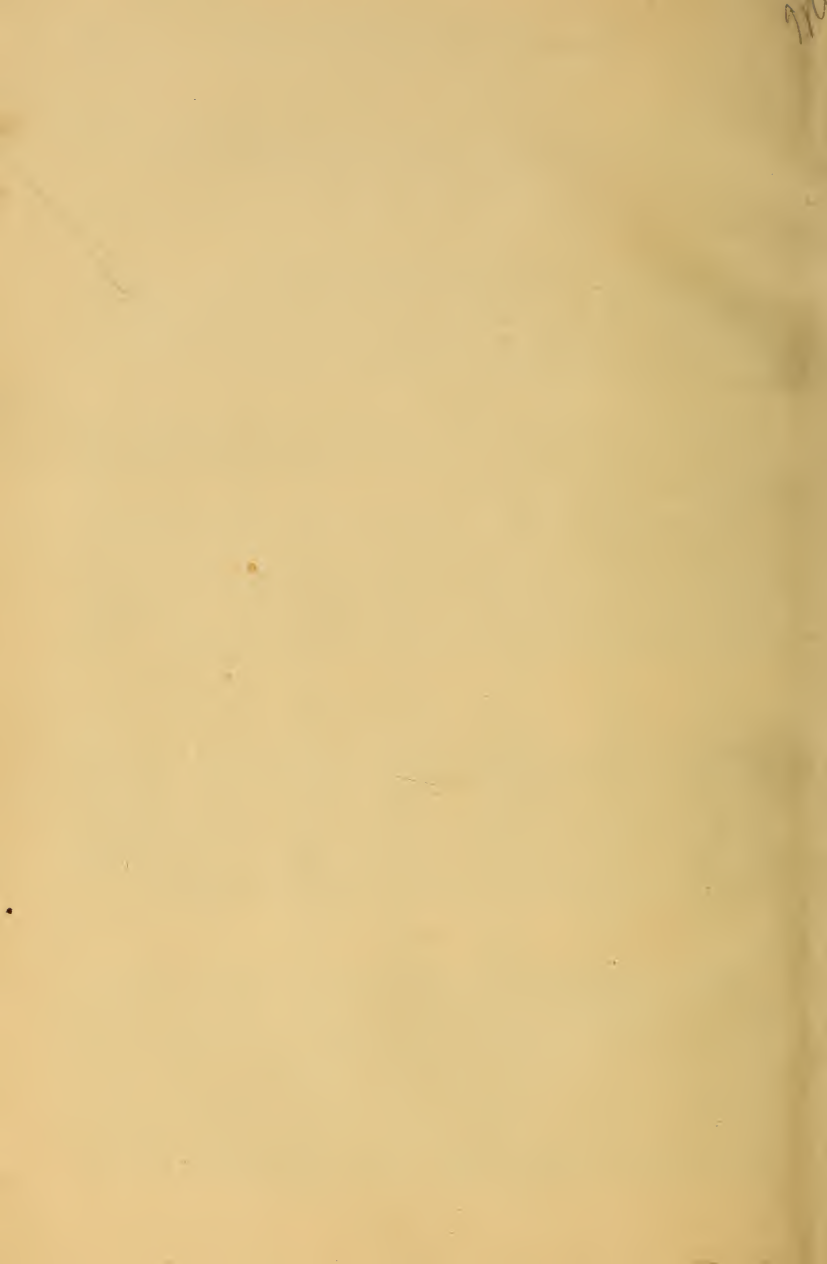
PAGES 54 and 55.—Reserves are calculated upon the basis of *net* premiums. The amount of loading, added to the net premium to make the gross premium, does not affect the reserve. Upon the same kind of a policy, issued at the same age and with the same number of premiums paid, the reserve would be the same, no matter what amount of annual premium might be charged for the insurance.

Under premium-paying policies, the amount of the reserve depends upon the age of the insured at the time the policy was issued, and the number of premiums paid. Under paid-up insurance, the amount of the reserve depends entirely upon the age of the insured at the date for which the reserve is computed.

The reserves given are based upon the Actuaries' Table of Mortality, with 4 per cent interest. See pages 27 and 28. For the sake of exactness it should be said that, while these reserves are for the most part greater than those based upon the American Experience Table, with $4\frac{1}{2}$ per cent interest, the latter are the greater at the very highest ages. The reason for this is that according to the American Table the term of life ends with age 95, while according to the Actuaries' it continues to age 100.

PAGE 57.—The net single premiums given are also the net values or reserves of a paid-up policy of \$1000 at the different ages. To estimate pretty nearly the amount of paid-up insurance which a company would allow for the surrender of an ordinary whole life policy with premiums payable annually, ascertain the reserve on that policy according to the table of reserves on pages 54 and 55, and divide 80 per cent of it by the single premium given for the age actually attained by the policyholder at the time of surrendering his original policy for paid-up insurance.

PAGE 58.—This table shows the component parts of both the net and the gross (or office) premiums at different ages, for an insurance of \$1000, payable at death. This analysis, however, is correct for the *first year* of the insurance at each age only. Each subsequent year the portion of the premium used for death claims is *greater*, and the portion used for reserve is *smaller* than these respective portions for the first year. The *accumulated* reserve increases each year by the addition of that year's reserve portion of the premium and of interest, as is shown in table on page 30. The "loading" remains the same theoretically for each year of the insurance, although the amount actually collected by the company will vary with the amount of dividend allowed on that account.





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